Jurnal Ekonomi Malaysia 48(2) 2014 3 - 17

Wage Effect of Over-Education and Mismatch in Malaysia: A Random Effect Approach

(Pengaruh Terlebih Pendidikan Dan Ketidaksepadanan Ke Atas Upah: Satu Pendekatan Kesan Rawak)

Zainizam Zakariya
Universiti Pendidikan Sultan Idris

ABSTRACT

This paper explores the effect of education mismatch and earnings outcome in Malaysia by taking both over-education and mismatch by field of study into account. Based on 2007 Malaysia Productivity Investment Climate Survey (PICS), it is found that around 18% and 28% of workers employed in jobs for which they are over and under-educated, respectively. In terms of mismatch, about 52% of workers are employed in jobs not corresponding to their field of study (17% does not related and 35% no specific field of study required). Close examination reveals that nearly two-third of the overeducated are employed in jobs outside their own field of study. With respect to earnings outcomes, Random Effect (RE) models show that being overeducated and employed outside own field of study resulted in earnings loss, between 5 and 8% for the former and 6 and 10% for the latter. Moreover, the wage penalty for being overeducated increases to roughly 14% to 17% if working in jobs unrelated to their field of study. Greater earning loss may suggest that among the overeducated, they are heterogeneous of both schooling and workers. As such, the results imply that there are significant costs to selecting a major and then deciding to work in an occupation unrelated to the major since knowledge and skills acquired is not completely general and cannot simply be transferred to other occupations.

Keywords: Over-education; mismatch; field of study; wage penalty; Malaysiat

ABSTRAK

Kajian ini meneroka pengaruh ketidaksepadanan pendidikan iaitu terlebih-pendidikan dan ketidaksepadanan dari segi bidang pendidikan ke atas upah di Malaysia. Berdasarkan data Productivity Investment Climate Survey (PICS) tahun 2007, sekitar 18% dan 28% daripada pekerja dikategorikan sebagai pekerja terlebih- dan terkurang pendidikan. Bagi ketidaksepadanan, 52% daripada responden bekerja di luar bidang pendidikan mereka (17% tidak berkaitan dan 35% tidak memerlukan bidang pendidikan yang khusus). Pemeriksaan yang teliti menunjukkan hampir dua pertiga daripada pekerja yang terlebih-pendidikan bekerja di luar bidang pendidikan mereka sendiri. Menggunakan model kesan rawak, pekerja yang terlebih-pendidikan dan pekerja ketidaksepadanan masing-masing menerima upah penalti sekitar 5 - 8% dan 6 - 10%. Upah penalti ini bertambah kepada antara 14% dan 17% bagi pekerja terlebih-pendidikan yang bekerja dalam pekerjaan yang tiada kaitan dengan bidang pendidikan mereka. Ini mungkin menunjukkan bahawa pekerja terlebih-pendidikan ini adalah heterogenes di kalangan mereka dari aspek pencapaian pendidikan. Dengan itu, terdapat kos yang signifikan yang ditanggung oleh individu dalam memilih bidang pengajian, kemudian memilih pekerjaan yang tidak berkaitan disebabkan pengetahuan dan kemahiran yang diperolehi tidak dapat dipindahkan sepenuhnya kepada pekerjaan yang lain.

Kata kunci: Terlebih-pendidikan;, ketidaksepadan; bidang pendidikan; upah penalty; Malaysia

INTRODUCTION

Today, more Malaysians attend higher education institutions (HEIs) than ever before. According to 2011-2012 National Educational Statistics, Ministry of Education (MoE), there were a total of 1.1 million students studying at both public and private higher educational institutions (HEIs) in 2012 compared to 664,402 in 2002, i.e - an increase of 67%. As a result, the number of graduates produced by HEIs has tremendously increased, from 221,366 in 2002 to 358,088 in 2012, an increase of 61%. The increasing supply of educated and skilled workers is due undoubtedly to the fact that education has been playing a pivotal role in enhancing individuals' productivity (Becker, 2009) and a greater expansion in the higher education institutions by the government.[1] The expenditure on education as a percentage of Gross Domestic Product (GDP) in Malaysia has increased from 4% in 1970 to 6% in 2011 (World Bank 2014).[2] This compares favour a number of developed countries such as the UK, USA, Japan and also Singapore (2.9% to 5.5% in 2011) (World Bank 2014).[3]

However, given the increase in the supply of highly educated workers than the demand for it in Malaysia in the last decades (World Bank 2011), a concern has arisen whether education is a really worthy investment when labour market outcomes in terms of employment is considered.[4] In general, the extent to which workers are utilised in the labour market can be identified in many ways including using information on workers' actual educational attainment and the jobs they occupied. Here, we focus on over-education and this term can be defined as the extent to which an individual possesses an education level that exceeds the requirements of a particular job. Conversely, under-education refers to the extent in which an individual's actual education level is below than what the job requires.[5] Related literature also defines overeducation in terms of a horizontal relationship in which workers may be mismatched if the field of study is inappropriate for the job occupied, even though the education level is appropriate (Robst 2007). This definition however could not be classified as over-education but more towards mismatch incidence (Robst 2008).

While there have been many over-education studies in the literature (see review made by Hartog 2000; McGuinness 2006; Leuven & Oosterbeek 2011), most over-education researches in Malaysia have focused only on mismatch incidence (Annie & Hamali 2006; Lim, Rich & Harris 2008; Osman, Yussof & Abu Hassan 2009; Zakariya & Battu 2013), with the exception of Zakariya (2013, 2014), and Zakariya & Md. Noor (2014) who focused on over-education. This perhaps is due to samples used by researchers in exploring over-education in Malaysia only have information on types of degree and the jobs occupied as compared to the information of education or skills required to perform or obtain a job as the one available in Zakariya (2013a). Studies on mismatch incidence in Malaysia have focused on graduate and the main finding is that around 31-35% of graduates were employed in jobs that do not correspond to their field of study (Morshidi et al. 2003; Annie & Hamali 2006; Lim et al. 2008; Osman et al. 2009; Lim 2011). Lim et al. (2008) reveal that a large portion of mismatched graduates were from social sciences background. This was in line with other studies from other countries (Dolton & Vignoles 2000; Robst 2007; Brynin & Longhi 2009).

While the issues of overeducated workers earning less than that of adequately-matched workers is well-documented in the literature (Hartog 2000; McGuinness 2006; Battu 2007; Leuven & Oosterbeek 2011), the effects of mismatch on earnings has gained less attention (Dolton & Vignoles 2000; Robst 2007; Brynin & Longhi 2009).[6] The question rises whether the wage effects from over-education vary once we take the mismatch between fields of study and occupations into consideration. One would assume that the penalty loss should be greater due to an individual mismatched based on quantity and type of schooling utilises less of the human capital acquired in school than a worker mismatched based only on quantity of schooling. To date, there is almost no study conducted to examine the wage impact of over-education if overeducated workers who are employed in jobs unrelated to their field of study, with the exception of Robst (2008).

Therefore, the main objectives of this paper are to explore the wage impacts of over-education and mismatch of workers in Malaysia. The country is an interesting case in its own right. It is a middle income country which has, since the 1970s, moved from being a primary goods exporter to one that is much more reliant on manufacturing and services. Education has played a pivotal role in this transformation with higher levels of investment and educational attainment, particularly higher education. Enrolments at tertiary level in both public and private higher education institutions (HEIs) between 2002 and 2012 have significantly increased leading to a growing number of graduates produced. Despite these developments, the country has been experiencing a shortage of skilled workers especially in science and technical fields (World Bank 2011). As Malaysia has slowly moved to a knowledge-based economy, enrolment in Malaysia's HEIs is dominated by students from Arts and Social Science programmes, and it consequently reflects the number of output (graduates) produced where they account for over half of the graduates produced during the period of 2002-2012 (MoE 2012). Hence, the quality and type of educated labour the country produces do not seem to match what is demanded by industries.

This paper is organised as follows. Section 2 outlines the theoretical background and followed by data and methodology in section 3. Section 4 highlights the results of the effects of over-education, and the final section concludes.

THEORETICAL BACKGROUND

This subsection explores the theoretical background to how mismatching emerges in the labour market. It should be acknowledged that up to date there is no single theory widely accepted regarding over-education and mismatch incidence. Instead, existing theoretical frameworks within labour economics attempt to explain the phenomenon of over-education in the labour market through the supply side and demand side approaches.

HUMAN CAPITAL THEORY

Human capital theory (Becker 1962) argues that productivity is a function of human capital accumulation, i.e.- education, experience and training and workers are paid based on the value of their marginal product. Consequently, wages are determined by the level of human capital accumulated. Educational mismatch arises

when an increase in the worker's educational attainment does not parallel the rise in demand for education, which leads to a reduction in the relative wage of highly educated workers. From the firm's perspective, falling wages encourage employers to substitute the more highly educated for lower educated workers and adjust production techniques to take advantage of this low-cost labour source. Highly educated workers are then placed in positions previously filled by lower educated workers. Mismatch here is transient, since firms will adjust their production processes and workers will reduce their investment in education in response to the lower relative earnings of educated workers.

CAREER MOBILITY THEORY

The theory of career mobility developed by Sicherman and Galor (1990) offers explanation for over-education based on an extended human capital model. This theory states that part of the return from education is not in the form of higher earnings but of a higher probability of occupational upgrading within or across firms. The highly educated may prefer to work in low-level jobs if the effect of schooling on the probability of promotion is higher than in other feasible entry positions with higher direct returns. Indirectly, this theory does recognise that the highly educated may have less experience or on-the-job training and may be willing to accept a job for which they are overeducated in order to accumulate skills that can be used later to switch to a higher-level occupation. Increased training may enable workers to acquire more firm-specific skills complementing their formal education to progress towards higher paid positions. In which case, over-education in the career mobility model is regarded as a short-term phenomenon that may begin one's working career.

JOB COMPETITION MODEL

The job competition model (JCM) explains the demand side for over-education and emphasises the importance of a person's relative position in a job queue (Thurow 1975). Individuals compete for job opportunities based on their relative training costs, as opposed to competition based on wages they are willing to accept given their human capital. Competition between firms for highly skilled workers creates a labour queue. As workers are hired based on their skills, they are ranked by their potential training costs for the firm. Highly educated workers may require less training, as they are ranked at the top of the labour queue and are therefore most sought after. Thus, they are matched to high-paying jobs. The implication is individuals will be likely to invest more in education as a defensive necessity, necessary to protect their place in the queue. The greater the numbers of educated persons in the labour market, the higher the proportion of individuals who are willing to invest more in education. The theory thus explains educational overinvestment and over-education.

SIGNALLING THEORY

Another possible explanation for the existence of over-education comes from signalling theory by (Spence 1973). A key requirement for this to work is that the cost of acquiring education decreases with ability. This theory suggests that since the labour market is characterised by imperfect information, employers deal with identifying the true productivity of each applicant whose actual productivity is only known once hired. Education can therefore help employers identify the more highly competent applicants. Individuals with greater educational achievement (which implies better skills or ability) are more likely to be employed. Consequently, individuals have an incentive to invest more in education to provide clearer signals, not only for employers but also to distinguish themselves from other job applicants. This is particularly true for low-ability individuals. The implication is that when investment in educational attainment becomes higher, the average education level of labour market entrants rises. This places greater pressure, particularly on the young, to pursue further study and attain education beyond what the job requires, thus resulting in increased over-education.

ASSIGNMENT THEORY

Assignment theory emphasises the supply and demand sides where an individual's performance varies in every job and for the economy as a whole, while total output depends on how workers are assigned their jobs (Sattinger 1993). Assignment theory therefore focuses on the problem of assigning workers to jobs. Within this framework, particular levels of human capital provide certain levels of productivity, indicating that individuals are allocated to jobs according to their skills. This allocation is optimal when workers are assigned top-down based on their skills, where the least competent are given the simplest jobs and the most competent are placed in the most complex jobs (Allen & Velden 2001). As a result, highly skilled individuals are more likely to be matched with job vacancies requiring a higher level of skills. However, the matching process may not be perfect, for example, when too many workers vie for a specific position. This may lead to some individuals being assigned jobs lower down the hierarchy. In this instance workers may be overeducated, whilst others prove to be undereducated.

DATA AND METODOLOGY

The Second Malaysia Productivity Investment Climate Survey (PICS-2) dataset is employed to explore the

incidence and wage impacts of over-education and mismatch in Malaysia. The PICS-2 is a workplace survey which was carried out in 2007 by the World Bank and the Economic Planning Unit across manufacturing and business support services sectors. The survey attempts to understand the investment climate faced by enterprises and how this impacts upon business performance. The PICS-2 covers nine major industries in the manufacturing sector (i.e. - food processing, textiles, garments, wood and furniture, chemical and chemical products, rubber and plastics, machinery and equipment, electrics and electronics and motor vehicles and parts) and five major business support service (BSS) industries (Telecommunication, Accounting, Advertising, Business Logistic and Information Technology). The total respondents in this survey were 13,500 across 1,418 workplaces. Respondents in this study however are confined to those who were in full-time employment, aged between 15 and 64 and who reported no missing in earnings. Based on these restrictions, this leaves about 13,420 respondents, of which 53.6% are males and 46.4% are females.[7]

TABLE 1. Mean and Standard Deviation of Selected Variables

Variable	POOLED (n = 13,432)		MANUFACTURING (n = 10,529)		SERVICES (n = 2,903)	
	Mean	S.D	Mean	S.D	Mean	S.D
Age	34.207	9.565	34.29	9.70	33.90	9.05
Male	0.536		0.54	0.50	0.50	0.50
Female	0.464		0.46	0.50	0.50	0.50
Years of schooling completed			10.56	3.52	13.23	2.99
Education level						
Degree	0.141	0.348	0.08	0.28	0.35	0.48
Diploma	0.145	0.352	0.12	0.32	0.24	0.43
Upper Secondary	0.363	0.481	0.38	0.49	0.29	0.45
Lower Secondary	0.217	0.412	0.25	0.43	0.09	0.29
Primary	0.105	0.306	0.13	0.33	0.03	0.16
Informal	0.029	0.169	0.04	0.19	0.00	0.07
Training	0.397	0.489	0.39	0.49	0.41	0.49
Marital status						
Single	0.368	0.482	0.36	0.48	0.40	0.49
Married	0.616	0.486	0.62	0.48	0.59	0.49
Separated/Widowed	0.016	0.125	0.02	0.13	0.01	0.10
Ethnic						
Malay	0.478	0.500	0.53	0.50	0.50	0.50
Chinese	0.340	0.474	0.36	0.48	0.40	0.49
Indian	0.084	0.277	0.09	0.29	0.09	0.28
Others	0.099	0.298	0.01	0.08	0.01	0.10
Region						
Central	0.433	0.496	0.36	0.48	0.71	0.45
North	0.208	0.406	0.23	0.42	0.12	0.32
South	0.263	0.44	0.31	0.46	0.07	0.26
East Coast	0.02	0.141	0.03	0.16		
Malaysia East	0.076	0.264	0.07	0.25	0.10	0.30
Occupation						
Management	0.138	0.345	0.13	0.34	0.16	0.37
Professional	0.127	0.333	0.07	0.26	0.32	0.46
Skilled Worker	0.322	0.467	0.35	0.48	0.22	0.41
Unskilled Worker	0.243	0.429	0.28	0.45	0.12	0.32
Non-Production/Clerical Worker	0.161	0.368	0.16	0.36	0.18	0.38
Apprentice	0.009	0.094	0.01	0.09	0.01	0.10
Salary (RM Monthly)	1,806.80	2,088.80	1529.16	1715.28	2819.00	2870.84
Firm size						
Small (<50 Emp)	0.475	0.499	0.44	0.50	0.59	0.49
Medium (50-150 Emp)	0.285	0.452	0.29	0.45	0.26	0.44
Large (>150 Emp)	0.24	0.427	0.26	0.44	0.15	0.36
Ownership						
Purely Domestically-Owned	0.722	0.448	0.70	0.46	0.82	0.39
Less Than 30% Foreign-Owned	0.043	0.203	0.05	0.21	0.03	0.17
More Than 30% Foreign-Owned	0.235	0.424	0.26	0.44	0.15	0.36

Table 1 provides summary statistics for the key variables used in this analysis. In line with other studies using this dataset, the sample of the BSS does not represent the whole sector in the service sector. As such, care should be taken in interpreting our descriptive statistics especially when comparing between the Manufacturing and BSS sectors. The respondents are on average 34 years old and reported to have had about 11.3 years of schooling attained which is equivalent in Malaysia to upper secondary qualifications. Nearly 40% of workers had once attended a training course at workplace. Married respondents, Malay, and workers from the central region represent a large proportion of the sample.

With respect to occupation, nearly one-third of the workers were employed as skilled workers and about one-fifth were in professional and managerial jobs. On average, workers earn about RM1,800 per month. Around 48% and 72% of workers employed in small firm size and firms purely domestically owned. There are some variations across sector. Workers in the Business Support Service sector seem more educated than workers in the manufacturing sector (13.23 vs 10.56 years of schooling completed). Indeed, over 50% of workers have higher qualification (diploma and degree) as compared to 20% in the manufacturing sector. This reflects occupation differences where nearly 50% of workers from BSS were employed in Management and professional jobs with the corresponding figure of 20% in the manufacturing sector. Lastly, workers in the BSS earn much higher than their manufacturing workers counterparts (RM2819 against RM1,529).

The PICS-2 allows us measuring over-education and mismatch using the subjective method, i.e.- relies on the worker's own assessment.[8] In particular, respondents were asked two questions about

i. "According to you, what is the most appropriate level of education for the work you are doing?"

ii. "According to you, what is the most appropriate field of education for the work you are doing?"

The first question comes with seven educational levels to choose from, starting from (1) degree, to (7) no qualification and there are four responses in the second question: (1) Only your own field, (2) Related to your field, (3), Completely different, and (4) No specific field is required. Table 2 shows the raw responses of the most appropriate level of education for the jobs respondents were doing by sector. In general, it is clear that the educational level required in doing current jobs depends upon sector. For manufacturing sector, upper secondary qualifications were the most appropriate level of education in doing their job (35.4%) regardless of gender (36.7% for females and 34% for males), followed by lower secondary (23%) and Diploma (27%). For both cases, there is a little gender difference in the responses. By contrast, degree is found to be the most appropriate level of education in doing current job in BSS sector, follow up by diploma qualification with 38% and 28%, respectively. For the latter there is a gender difference - 24% for males and 32% for females.

Sector matter is also obvious with respect to the most appropriate field of education. As shown in Table 3, the majority of workers with 57% in manufacturing sector, regardless of gender, were employed in jobs unrelated to their field of study (completely different and no specific field of study is required). In contrast, nearly 70% workers in the BSS were employed in jobs that correspond to their fields of study (only your own field and related to your field). Again, there are gender differences in the responses.

By comparing the survey respondents' actual educational attainment (Table 1) with the perceived appropriate education required for the job (Table 2), we derived conventional estimates of over-education.

TABLE 2. Raw Responses of Most Appropriate Level of Education in Doing Current Job by Sector

Most appropriate level of education	Manufacturing			Business Support Service		
	Male (%)	Female (%)	Total (%)	Male (%)	Female (%)	Total (%)
Degree	605	484	1,089	548	551	1,099
	10.55	10.10	10.34	37.56	38.42	37.99
Diploma	864	926	1,790	351	461	812
	15.07	19.32	17.00	24.06	32.15	28.07
Upper secondary	1,966	1,760	3,726	324	339	663
	34.28	36.73	35.39	22.21	23.64	22.92
Lower secondary	1,416	1,011	2,427	145	66	211
	24.69	21.1	23.06	9.94	4.6	7.29
Primary	489	402	891	66	11	77
	8.53	8.39	8.46	4.52	0.77	2.66
Informal	143	95	238	15	3	18
	2.49	1.98	2.26	1.03	0.21	0.62
None (Illiterate)	252	114	366	10	3	13
	4.39	2.38	3.48	0.69	0.21	0.45
Total	5,735	4,792	10,527	1,459	1,434	2,893
	100.00	100.00	100.00	100.00	100.00	100.00

Where an individuals' actual schooling exceeds what the job requires they are considered to be overeducated ($S^a > S^r$). Where an individuals' actual level of education is below that required for the job they are classified as under-educated ($S^a < S^r$). Those whose actual educational attainment is appropriate for the job (i.e. actual and required education are the same) are deemed well-matched ($S^a = S^r$).

It should be acknowledged that there are some limitations of using the subjective method as measurement of over-education. While the method in theory, it incorporates all information about a respondent's specific job and the worker is actually in the best position to understand the requirements of an occupation (Hartog 2000), respondents may however lack sufficient benchmarks against which to assess their job requirements, as may be evident for young workers who have little work experience. Furthermore, whether or not workers are evaluating the actual education level required to get or to do the job may be unclear. Indeed, workers may inflate or overstate the requirements of the jobs as a form of self-worth (Hartog 2000), which may lead to an under- or overestimation of over-education.

Nevertheless, as shown in Table 4, workers in the BSS are better-matched compared to their manufacturing sector counterparts. For the former, the incidence of over-education, well-matched and under-education respectively stands at 11%, 67% and 22% with the corresponding figure of 19%, 52% and 30% for the latter. There is no gender difference in these incidences in the BSS but women (men) have higher incidence of well-matched undereducated in the manufacturing sector. Close examination reveals that nearly two-third of the overeducated are employed in jobs outside their own field of study (see Figure 1). This figure however is higher in the manufacturing and much lower in the BSS (68% against 48%).

The incidence of over-education here is slightly lower, between 1 and 3 percentage points lower than the one who found in Zakariya (2014) as the author's sample covers only Malaysian workers.[9] Nevertheless, over-education in Malaysia seems to be at the lower while under education seems to be higher as compared to the existing estimates.[10] This might be due to the fact that our country has experienced a skill shortage in the last decade (World Bank 2009). As a result, perhaps employers in this sector employ individuals with lower educational attainment to do jobs that are typically done by highly educated workers, hence higher under-education (World Bank, 2009).

To allow the wage impacts of over-education and mismatch, this study utilise an extended version of Mincer's earnings equation following McGuinness (2006). The equation can be written as follows:

TABLE 3. Raw Responses of Most Appropriate Field of Education in Doing Current Job by Sector

Most appropriate field of education	Manufacturing			Business Support Service		
	Male (%)	Female (%)	Total (%)	Male (%)	Female (%)	Total (%)
Only your own field	399	303	702	228	197	425
	6.96	6.32	6.67	15.63	13.74	14.69
Related to your field	2,010	1,831	3,841	744	822	1,566
	35.05	38.21	36.49	50.99	57.32	54.13
Completely different	1,020	793	1,813	204	231	435
	17.79	16.55	17.22	13.98	16.11	15.04
No specific field is	2,306	1,865	4,171	283	184	467
	40.21	38.92	39.62	19.4	12.83	16.14
Total	5,735	4,792	10,527	1,459	1,434	2,893
	100.00	100.00	100.00	100.00	100.00	100.00

TABLE 4. The Incidence of Over-Education Across Sector

	Manufacturing			Business Support Service		
	Male (%)	Female (%)	Total (%)	Male (%)	Female (%)	Total (%)
Well-matched	2,784	2,663	5,447	945	980	1,925
	48.54	55.58	51.75	64.77	68.34	66.54
Overeducated	1,063	897	1,960	184	157	341
	18.54	18.72	18.62	12.61	10.95	11.79
Undereducated	1,888	1,231	3,119	330	297	627
	32.92	25.69	29.63	22.62	20.71	21.67
Total	5,735	4,791	10,526	1,459	1,434	2,893
	100.00	100.00	100.00	100.00	100.00	100.00

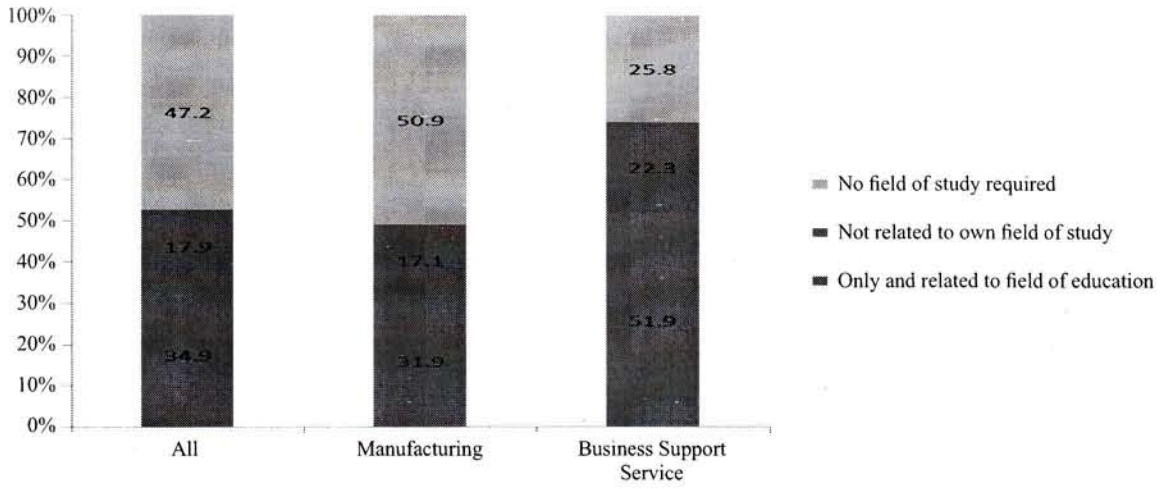

FIGURE 1. The Percentage of Overeducated Workers Who are Mismatched by Field of Study Across Sector

$$\ln w_i = \alpha_{0i} + x_i'\alpha_1 + \alpha_2 S_i + \alpha_3 OE_i + \alpha_4 UE_i + \alpha_5 Mismatch_i + \alpha_6 Age_i + \alpha_7 Age_i^2 + \mu_i \quad (1)$$

where ln w_i is a log of monthly earnings for individuals i, x is a vector of explanatory variables, S is individuals' actual education, OE (UE) is a dummy variable which takes on 1 if the worker is overeducated (undereducated), and 0 otherwise. *Mismatch* is vector of mismatch dummy variables as mentioned in Table 3. *Age* is a proxy for individuals' work experience, Age^2 is quadratic work experience and μ is an error term. Over-education and mismatch indicators are first entered separately and then jointly to determine the effects of mismatch on overeducation penalty. If the argument that the lower earning returns to overeducation stems from underutilisation of skills and knowledge holds, then controlling for mismatch should reduce the penalty from over-education.

To examine whether or not the earnings outcomes of workers who are overeducated and are also mismatched in terms of field of education, the following equation is employed:

$$\ln w_i = \alpha_{0i} + x_i'\alpha_1 + \alpha_2 S_i + \alpha_3 OE_i * Mismatch_i + \ldots + \mu_i \quad (2)$$

It would be expected that individuals who are overeducated but working in jobs for which their actual fields of study are not required for current job are expected to earn less than their counterparts - overeducated workers who are well-matched in terms of field of education. The reason is that the degree of transferability skills would be greater for the former than for the latter as such workers are expected to transfer a greater portion of skills from their schooling to job than workers who are employed in jobs that do not correspond to their field of education.

All constant terms and coefficients in equations (1) and (2) are estimated using Ordinary Least Square (OLS) and separate analysis is undertaken for the pooled, male and female samples. Furthermore, separate analysis is done by sector. Since the data utilised here is in hierarchical form where workers are grouped into larger units, i.e. workplaces, individuals from the same workplace have to some extent similar characteristics when compared with those from other workplaces. Given the fact that not all these characteristics can be measured empirically, it follows that the disturbances might be correlated. Hence, the coefficient estimated when using the OLS could be downwardly/upwardly biased due to the standard model employed here (equations 1 and 2) violate the assumption of independence.[11]

Equation (1) can then be amended to give:

$$\ln w_{ij} = \alpha_{0ij} + x_{ij}'\alpha_1 + \alpha_2 E_{ij} + \alpha_3 OE_{ij} + \alpha_4 UE_{ij} + \alpha_5 Mismatch_{ij} + \alpha_6 Z_{ij} + \mu_{ij} \quad (3)$$

where subscript j represent firm 1, 2, 3,..., J, and Z_{ij} denote a vector of workplace characteristics for individual i at firm j. Instead of treating α_{0ij} as constant, one assume that it is a random variable with a mean value of λ_0 (no subscript i). The intercept value of an individual in firm j can be expressed as (see Gujerati 2004):

$$\lambda_{0i} = \lambda_0 + e_{ij} \quad i = 1, 2, \ldots, N \quad (4)$$

where e_{ij} is a random error term with a mean value of zero and variance of σ_e^2. Since all firms included in the PICS-2 are drawn from nine major industries in the manufacturing and BSC sectors. For each sector, firms have a common mean value for the intercept (λ_0) and the individual differences in the intercept values of each firm are reflected in the error term e_{ij}.

Substituting equation (4) into (3) generates:

$$\ln w_{ij} = \alpha_{0ij} + x_{ij}'\alpha_1 + \alpha_2 E_{ij} + \alpha_3 OE_{ij} + \alpha_4 UE_{ij} + \alpha_5 Mismatch_{ij} + \alpha_6 Z_{ij} + e_i + \mu_{ij}$$
$$\ln w_{ij} = \alpha_{0ij} + x_{ij}'\alpha_1 + \alpha_2 E_{ij} + \alpha_3 OE_{ij} + \alpha_4 UE_{ij} + \alpha_5 Mismatch_{ij} + \alpha_6 Z_{ij} + \varepsilon_{ij} \quad (4)$$

where

$$\varepsilon_{ij} = e_i + \mu_{ij} \quad (5)$$

The composite error term e_{ij} consists of two components, e_i which is an individual-specific error component, varying independently across individuals both within and across firms, and μ_{ij} which is the combined individual and firm error component, i.e. it differs across firms but is presumably constant for individuals within the same establishment. This error structure captures the random effects model (normally used with panel data). The usual assumptions under the random effects model are (Gujerati, 2004):

$$e_i \sim N(0, \sigma_e^2)$$
$$\mu_{ij} \sim N(0, \sigma_\mu^2)$$
$$E(e_i u_{ij}) = 0 \qquad E(e_i e_l) = 0 \qquad (i \neq l)$$
$$E(\mu_{ij} u_{is}) = E(\mu_{ij} \mu_{lj}) = E(\mu_{ij} \mu_{ls}) = 0 \qquad (j \neq ls;\ i \neq l)$$

that is, the individual error components are not correlated with each other and are not auto-correlated across individuals and workplaces. As a result of these assumptions, all disturbances have the following variance:

$$E(\varepsilon_{ij}) = 0 \tag{6}$$

$$Var\ (\varepsilon_{ij}) = \sigma^2 = \sigma_e^2 + \sigma_\mu^2 \tag{7}$$

but for a given j, the disturbances for different individuals are correlated because of their common component, λ_j. As such, an efficient estimator is possible using the generalised least squares (GLS) method. It should also be noted that any workplace and firm effects not captured in Z_j are assumed to be random and hence merged with the disturbance term.[12]

There are at least two main issues emerging in estimating earnings effects. One is the endogeneity of over-education. Wage determination and being in a job for which a person is overeducated are endogenously unrelated. Endogeneity arises if over-education is assumed related to unobserved characteristics, such as a lower level of ability and the motivation of the overeducated. For example, assume that some workers with low unobserved ability have lower earnings. If these workers are more likely to be overeducated, this further suggests that the disturbance of the worker's occupational selection process could be correlated with the error term in the wage equation. This further proposes that over-education is subject to the endogeneity problem, as the presence of endogeneity in earnings regression will overestimate (biased upward) the rate of return to over-education and underestimate (biased downward) the rate of return to under-education.[13]

Second, the wage impact of over-education may be subject to bias because individual heterogeneity via differences in ability, talent and skills are ignored. Overeducated tends to have lower unobserved ability than their well-matched counterparts. Indeed, overeducated workers are found to be heterogeneous among them. Chevalier & Lindley (2009) differentiates between apparent over-education and genuine over-education and when it comes to the earnings impact, the authors finds that a pay penalty compared with matched graduates is much higher for the genuinely than the apparently overeducated (approximately 26% compared to 8%). The large difference observed in pay between the two groups reinforces the view that the overeducated cannot be considered homogeneous. This indicates that controlling for individual heterogeneity is necessary to estimate the impact of over-education. We are not fortunate here since the data we utilised here lack of potential instruments for unobserved ability. The model could be identified by using quantile regression approach (McGuinness & Bennett 2007), though this is not the scope of this paper.

EMPIRICAL RESULTS

Tables 5 to 7 present the results of random effects (RE) of the wage impacts of over-education and mismatch across gender and sector. This study should acknowledge here that the RE estimation is more appropriate than the OLS once this study did the Lagrange Multiplier (LM) test.[14] The results of the OLS estimation are available upon request. The rho (r) term denotes the fraction of the variance attributable to the workplace error term. It is common practice in the literature that the rho (ρ) decreases with additional covariates (Wooden & Bora, 1999).

Looking at firstly Table 5, four specifications are estimated. Model 1 explains nearly 60% of the total variation in earnings; and the fraction of the variance attributable to the workplace error term is 55%. The coefficients on over-education (under-education) are negative (positive) and highly significant indicating that the overeducated (undereducated) earn significantly less (more) than their well-matched counterparts. In particular, overeducated workers earn 11% less than their comparable well-matched workers while undereducated workers earn a wage premium of 11% than that of well-matched workers.[15] For this, (Zakariya 2014) found that the wage penalty for being overeducated was reported around 6 and 10%, yet, the author used the ORU specification in estimating the earnings outcomes amongst the overeducated workers.[16] The finding here are somewhat comparable to other studies (see for example Leuven & Oosterbeek 2011). In model 2, over-education is replaced by mismatch variables and the results show that being employed in jobs unrelated to individuals' own field of study leads to earnings penalty, and these are statistically significantly different from zero at 0.01. Yet, the magnitudes of the penalty depend upon the degree of mismatch. Workers who employed in jobs that completely different from their own field of study, approximately earn 5% less than well-matched workers whose the jobs occupied related to their fields of study (reference group).[17] The penalty goes up to 9% for workers whose field of education are not required.

TABLE 5. The Effects of Over-Education and Mismatch on Wages – Random Effect (RE)

Log monthly income	Spec 1	Spec 2	Spec 3	Spec 4
Well-matched (ref group)				
Over-education (OE)	-0.1069***		-0.0987***	-0.1297***
	(0.0104)		(0.0105)	(0.0177)
Under-education (UE)	0.1055***		0.0999***	0.0759***
	(0.0098)		(0.0099)	(0.0150)
Own field of study (ref group)				
Outside own field		-0.0497***	-0.0404**	-0.0595***
		(0.0116)	(0.0114)	(0.0153)
No specific field required		-0.0922***	-0.0646***	-0.0898***
		(0.0111)	(0.0111)	(0.0146)
Well-matched*own field of study				
OE*outside own field				-0.1670***
				(0.0230)
OE*no specific field required				-0.1520***
				(0.0181)
UE*outside own field				0.0687***
				(0.0230)
OE*no specific field required				0.0293
				(0.0195)
Education (ref group - degree)				
Diploma	-0.2054***	-0.1627***	-0.2038***	-0.2025***
	(0.0144)	(0.0142)	(0.0144)	(0.0162)
Upper sec	-0.3865***	-0.2953***	-0.3719***	-0.3676***
	(0.0157)	(0.0151)	(0.0159)	(0.0181)
Lower sec	-0.5131***	-0.3749***	-0.4921***	-0.4880***
	(0.0188)	(0.0173)	(0.0191)	(0.0218)
Primary	-0.6386***	-0.4604***	-0.6117***	-0.6090***
	(0.0235)	(0.0209)	(0.0238)	(0.0270)
Informal	-0.7038***	-0.4813***	-0.6726***	-0.6678***
	(0.0317)	(0.0281)	(0.0321)	(0.0377)
Age	0.0498***	0.0509***	.0499***	0.0497***
	(0.0026)	(0.0026)	(0.0026)	(0.0029)
Age sqr	-0.0005***	-0.0005***	-0.0005***	-0.0005***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Training	0.0719***	0.0823***	0.0714***	0.0710***
	(0.0106)	(0.0106)	(0.0105)	(0.0123)
Female	-0.1981***	-0.1983***	-0.1980***	-0.1980***
	(0.0080)	(0.0081)	(0.0080)	(0.0095)
Married	0.0425***	0.0418***	0.0419***	0.0416***
	(0.0086)	(0.0087)	(0.0086)	(0.0093)
Malaysian	0.2215***	0.2189***	0.2164***	0.2175***
	(0.0455)	(0.0473)	(0.0457)	(0.0454)
Malay (ref group) Chinese	0.2658***	0.2729***	0.2634***	0.2637***
	(0.0096)	(0.0097)	(0.0096)	(0.0111)
Indian	0.0344**	0.0371***	0.0344**	0.0346**
	(0.0140)	(0.0141)	(0.0140)	(0.0145)
Other	0.0493	0.0408	0.0464	0.0468
	(0.0435)	(0.0453)	(0.0437)	(0.0415)
Firm size – Small-size (ref group)				
Medium-size	0.0015	0.0085	0.0017	0.0019
	(0.0182)	(0.0183)	(0.0182)	(0.0182)
Large-size	0.0754***	0.0797***	0.0730***	0.0731***
	(0.0223)	(0.0224)	(0.0223)	(0.0218)
Ownership–domestically owned (ref group)				
Less than 30% foreign-owned	0.0916**	0.0923**	0.0916**	0.0921***
	(0.0365)	(0.0367)	(0.0364)	(0.0345)
More than 30% foreign-owned	0.0532***	0.0564***	0.0550***	0.0554***
	(0.0206)	(0.0207)	(0.0205)	(0.0203)

cont.

Table 1 continue

N	13,200	13,200	13,200	13,200
No. of group	1363	1363	1363	1363
R2_between	0.7252	0.7201	0.7244	0.7254
R2_within	0.4385	0.4310	0.4405	0.4410
R2_overal	0.5995	0.5932	0.5998	0.6006
Rho (ρ)	0.5540	0.5532	0.3285	0.3193
LM test	13623.9***	13511.5***	1665.2***	4017.1***

Robust standard errors in parentheses
*, ** and *** denote 0.1, ** and ***, respectively

TABLE 6. The Wage Effects of Over-Education and Mismatch Across Gender - RE

Log monthly income	MALE	FEMALE
Education – degree (ref group)		
Diploma	-0.2166***	-0.2006***
	(0.0238)	(0.0196)
Upper sec	-0.3557***	-0.3705***
	(0.0269)	(0.0221)
Lower sec	-0.4517***	-0.5227***
	(0.0309)	(0.0284)
Primary	-0.5240***	-0.6805***
	(0.0362)	(0.0365)
Informal	-0.5629***	-0.8029***
	(0.0491)	(0.0511)
Adequately-matched (ref group)		
Over-education (OE)	-0.1328***	-0.1237***
	(0.0261)	(0.0227)
Under-education (UE)	0.0599***	0.0812***
	(0.0209)	(0.0203)
Own field of study (ref group)		
Outside own field	-0.0489**	-0.0608***
	(0.0216)	(0.0207)
No specific field required	-0.0851***	-0.0817***
	(0.0202)	(0.0188)
Well-matched#own field of study		
OE#outside own field	-0.1635***	0.1623***
	(0.0328)	(0.0301)
OE#no specific field required	-0.1144***	-0.1683***
	(0.0242)	(0.0244)
UE#outside own field	0.0460***	0.0888***
	(0.0287)	(0.0327)
UE#no specific field required	0.0138	0.0478*
	(0.0252)	(0.0279)
Age	0.0532***	0.0541***
	(0.0037)	(0.0046)
Age sqr	-0.0005***	-0.0006***
	(0.0000)	(0.0001)
Training	0.0522***	0.0938***
	(0.0171)	(0.0144)
Cons	6.4126***	6.4896***
	(0.1177)	(0.1245)
N	7076	6124
N of. Group	1304	1261
R2_overall	0.6805	0.6774
Rho (ρ)	0.3600	0.3610
LM test	869.50***	1525.1***

Robust standard errors in parentheses
*, ** and *** denote 0.1, ** and ***, respectively

TABLE 7. The Wage Effects of Over-Education and Mismatch Across Sector - RE

Log monthly income	MFC	SERVICE
Education – degree (ref group)		
Diploma	-0.2136***	-0.2050***
	(0.0190)	(0.0230)
Upper sec	-0.3812***	-0.3635***
	(0.0195)	(0.0297)
Lower sec	-0.5004***	-0.4711***
	(0.0222)	(0.0450)
Primary	-0.6229***	-0.4288***
	(0.0261)	(0.0800)
Informal	-0.6982***	-0.1866
	(0.0327)	(0.1267)
Adequately-matched (ref group)		
Over-education (OE)	-0.1364***	-0.1107***
	(0.0187)	(0.0315)
Under-education (UE)	0.0769***	0.0683***
	(0.0160)	(0.0255)
Own field of study (ref group)		
Outside own field	-0.0649***	-0.0394
	(0.0159)	(0.0309)
No specific field required	-0.0968***	-0.0241
	(0.0147)	(0.0323)
Well-matched#own field of study		
OE#outside own field	-0.1612***	-0.1799***
	(0.0262)	(0.0429)
OE#no specific field required	-0.1537***	-0.1086**
	(0.0197)	(0.0423)
UE#outside own field	0.0719***	0.0743*
	(0.0263)	(0.0431)
UE#no specific field required	0.0357*	-0.0439
	(0.0207)	(0.0581)
Age	0.0452***	0.0807***
	(0.0028)	(0.0065)
Age square	-0.0004***	-0.0008***
	(0.0000)	(0.0001)
Training	0.0681***	0.0880***
	(0.0121)	(0.0204)
Female	-0.2350***	-0.0627***
	(0.0093)	(0.0156)
Cons	6.7243***	0.0000
	(0.0929)	(0.0000)
N	10390	2810
N of. group	1073	290
R2_overall	0.5603	0.5283
Rho (ρ)	0.3540	0.3590
LM test	1317.50***	1508.47***

Robust standard errors in parentheses
, ** and * denote 0.1, ** and ***, respectively*

When both over-education and mismatch are controlled for (Model 3), the effects of over and under-education remain relatively unchanged. By contrast, the inclusion of both variables significantly reduce the earnings loss by around 3 percentage points among mismatched workers, whose specific field is not required for their jobs. In Model 4, we do an interaction dummy between over-education and mismatch and we find some interesting results. Overeducated workers but whose work and field of study are completely different and not required earn 15.4% and 14.1%, respectively much lower than well-matched workers. These results are in line with

Robst (2008) where the author found the wage penalty for overeducated is greater between 19% and 22% if they work in jobs not related to their field of education. This compares to -5% to -7% if they (overeducated) work in jobs that somewhat relate to their field of education. This study also finds the penalty of over-education and mismatch increases between two to three percentage points. The over-education penalty increases to 12.2% whilst the wage loss for being employed in jobs that are completely different and do not require specific field raise to 5.8% and 8.6%, respectively. These results indicate that the wage effects increase as the difference between schooling and work becomes greater.

To see whether the wage effects of both over-education and mismatch could differ by gender, we run separately the full model for men and women. The results presented in Table 6 show that the earnings penalties look similar with the pooled sample (Table 5). There is almost no gender difference in the returns to over-education and mismatch. One exception is the penalty for overeducated whose work and field of study are completely different is 5 percentage points lower for men than for women (10.8% against 15.5%). Nevertheless, the wage premium of under-education is greater for female than for men (8% against 6%). Similarly, the premium undereducated who report working in a job that is completely not related to their own field of study is also higher for women than for men (9% vs 5%).

We also regress separately across sector to ascertain whether the returns to education vary as we found in our preliminary analysis. Table 7 presents the results of this regression. While the wage loss for being mismatched or overeducated does exist across sectors, the loss is somewhat lower in the BSS than in the manufacturing sector. An overeducated worker working in the manufacturing sector earns 12.7% less than a well-matched worker. This is comparable to 10.5% in the BSS sector. Workers in the manufacturing who employed in a job that is completely not relevant to their own field earn 6.3% less than well-matched workers and pay loss increases to 10% for those who report working in a job that do not require specific field of education. Instead, there is no evidence of the penalty of mismatch workers in the BSS. Focusing on dummy interaction effects, this study found some interesting results. The penalty loss for overeducated workers whose field of study and work are not related is slightly higher reported in the BSS than the manufacturing one (16.5% vs 14.8%). However, the earnings loss for overeducated workers whose no specific field of study required is lower in the BSS than in the manufacturing (10% against 15%).

Higher wages penalty among overeducated workers who are also mismatched may stem from the fact that human capital acquired in college is not completely general and cannot simply be transferred to other occupations. As such, workers who enter different occupations incur wage losses because some of their human capital cannot be used in the new occupation. Individuals with the greatest distance between their human capital and job incur the largest wage losses.

DISCUSSIONS AND CONCLUSIONS

The match between workers' actual educational attainment and jobs occupied has gained a considerable research. However, very little study examines the wage impacts of over-education in terms of type of schooling. In this paper, we consider both aspects, i.e. - over-education and mismatch between field of study and work in Malaysia as we have at our disposal a unique workplace dataset that contains extensive information on how individuals utilise their jobs.

Using the second Malaysia Productivity Investment Climate Survey (PICS-2), our calculation based on subjective method shows around 18% and 28% of workers employed in jobs for which they are overeducated and undereducated, respectively. About 52% of workers are employed in jobs to which their field of study does not correspond (17% does not relate and 35% no specific field of study required). There is no gender difference with respect to over-education and mismatch, but by sector, over-education is lower reported in the BSS than manufacturing sector. Also, well-matched workers are greater in the former than the latter. Close examination reveals that between 48% and 68% of the overeducated are employed in jobs outside their own field of study.

With respect to earnings outcomes, being overeducated and mismatched resulted in greater earnings loss, between 10 and 13% for the former and 4 to 10% for the latter. The variations in these earnings penalty are somewhat related to sector where BSS sector tends to provide lower penalty estimation than the manufacturing one. What is more, the dummy interaction effects reveal that the wage effects of over-education depending on the degree of mismatch. Relative to well-matched, overeducated who report working in a job that is completely irrelevant to their field of study earned much lower, around 14% to 17% and between 10% and 15% if no specific field of study is required.

Greater earning loss may suggest that among the overeducated, they are heterogeneous of both schooling and workers. As such, the results imply that there are significant costs to selecting a major and then deciding to work in an occupation unrelated to the major due to human capital acquired is not completely general and cannot simply be transferred to other occupations. Moreover, such findings could reflect the decisions making faced by our students once completing post-secondary school. Although the PICS-2 has no information on respondent's college major, the findings suggest that students should consider the potential for finding any job that correspond to their field of education. Being

not capable of getting the right employment reduces the returns to education for any field. Certainly, the cost to changing jobs once landed in over-education or mismatch is higher in terms of lower job satisfaction (Belfield & Harris 2002; Kler 2006; Fleming & Kler 2008; Zakariya 2013b) and increases the likelihood of being engaged in on-the-job search or quit intention (Zakariya 2012). Indeed, over-education is widely accepted as a long term phenomena in the labour market (see for example (Hartog 2000; Rubb 2003, 2005).

Another implication of the findings is an individual's actual level of educational attainment might not offer a complete measure of the human capital that he or she brings to a particular job. This is because in addition to educational attainment, human capital endowment can be acquired from work experience and on-the-job training. This implies that over-education is associated with excess schooling but a lack of training and work experience. However, the reverse holds for undereducated employees who have accumulated better forms of human capital endowment (work experience and training) to compensate for lack of education. This manifests in the so-called "substitutability hypothesis" (Sloane, Battu & Seaman 1996). Unfortunately, this is not the main focus of the study. Alternatively, the findings could also suggest that earnings are then no longer a function solely of the supply side, i.e. individuals' actual schooling or the demand side, i.e.- education required for the job. Instead, earnings are treated as a function of the demand (required education) and supply side (attained education) which is in line with the assignment theory as mentioned earlier.

There are several important caveats to these results. First, the data utilised here are general and not the graduate one as used in Dolton & Vignoles (2000) and Robst (2007b, 2008). This may raise the question about field of study reported among the lowly educated workers, especially those with primary and lower secondary qualification. Second, the role of unobserved variables has not been considered in this paper. Many empirical studies exhibit that higher a greater wage penalty among overeducated or mismatched workers are partly due to the overeducated being somewhat less able than their well-matched counterparts, but we are unable to test the validity of this argument with our data. Third, the measure of over-education and mismatch is based on workers' own assessment and this may be subject to some degree of measurement error. However, studies examining the wage effects of over-education have found that the earnings loss for being overeducated or mismatched quantitatively has yielded similar results regardless of how one measures educational mismatch.

Nevertheless, the phenomenon of over-education among workers in the Malaysian labour market may impede the country's intention to move towards the state of being a high-income country, as outlined in the "New Economic Model" blueprint as it reduces individuals' productivity. Over-education and mismatch incidence could be reflect the education and training system in Malaysia are not well-provided our students with the skills and knowledge required in order to encounter the needs of a changing labour market, putting the country's industrial and service sectors increasingly under threat from rising competitors. As a result, there are significant costs to selecting a major and then deciding to work in an occupation unrelated to the major due to human capital acquired is not completely general and cannot simply be transferred to other occupations. But one cannot blame the government *per se,* because as mentioned in the National Economic Action Council (2010), the mismatch incidence is partly due to the lack of a well-integrated between education and employers' need in the demand-driven labour market system.

ACKNOWLEDGEMENT

The authors acknowledge the World Bank Enterprise Survey (WBES) from whom the 2007 Productivity Investment Climate Survey (PICS) data was acquired. This organisation does not bear any responsibility for the authors' analysis and interpretations of the data. This research was funded by a University Research Grant (GRU) under the Research management and Innovative Centre (RMIC), Universiti Pendidikan Sultan Idris (UPSI) (Project code: 2014-0049-106-01).

ENDNOTES

1 Moreover, the Malaysian government passed in 1996 the Private Higher Education Act (PHEA) in Parliament, which allowed a greater role for the private sector in education provision. In 1995, there were 156 private HEIs in Malaysia and this increased substantially to over 550 (50 of them private universities) in 2012. Apart from that, currently there are 74 public HEIs where 20 are public universities.

2 Retrieved on 4th July, 2014 from http://data.worldbank.org/indicator/SE.XPD.TOTL.GD.ZS/countries.

3 Retrieved on 4th July, 2014 from http://data.worldbank.org/indicator/SE.XPD.TOTL.GD.ZS/countries.

4 According to the 2011 Grduate Tracer Study (GTS) conducted by MoE, 27% of graduates from HEIs were still unemployed one year after graduation. This percentage went up to 28% for private HEIs and down to 17% among Community College graduates.

5 Some studies use the term "over-qualification" rather than "over-education" (Frank 1978; Brynin 2002; Frenette 2004; Green and McIntosh 2007). Green and McIntosh (2007), in their study using a British sample, acknowledged the differences between overeducation and over-qualification: "*In our own analysis, we prefer the terms 'over-qualified' and 'under-qualified', and prefer not to use the terms over- and under-education because of the connotation attached that there is too much or too little education being provided, which, as we describe below, is only one possible reason for the presence of over-qualified or under-qualified workers*" (Green and McIntosh 2007).

6 The reason why workers employed in jobs for which does not correspond to their field of study earn less than

well-matched workers as some human capital acquired in formal education is occupation specific and cannot be transferred to jobs in different fields.

7 It should be acknowledged that the exact number of workers for the analysis purpose could be lower due to missing data in some explanatory variables.

8 Apart from subjective method, there are two more methods commonly used in measuring over-education, i.e.- objective method and modal method. For details about these methods, please see McGuinness (2006) and Leuven & Oosterbeek (2011). The choice of method usually depends on data availability.

9 When the sample is confined to only Malaysian workers, the incidence of over-education seems to be quite similar to Zakariya (2014) and Zakariya & Mohd. Noor (2014).

10 Reviews from Groot (2000), McGuinness (2006) and Leuven & Oosterbeek (2011) show that the incidence of over-education is much higher than the incidence of under-education. For example, a recent review by Leuven & Oosterbeek (2011), over-education using the subjective method stands at an average over-education rate of 37% whilst under education stands at an average of 23%.

11 Wooden and Bora (1999) and (Battu, Belfield, & Sloane, 2003) found that the OLS estimation tend to downwardly bias as compared to the Random Effect (RE) when using employer-employee survey.

12 Random effect is preferable than fixed effect model is due to the fact that the employees survey of the PICS-2 is a cross sectional and not a panel data. Therefore, Random variables" are assumed to be values that are drawn from a larger population of values and thus will represent them. Thus, we expect to generalize the results obtained with a random variable to all other possible values of that random variable.

13 Several authors address this issue by using an instrumental variable (IV) approach (Groot & Maasen Van Den Brink, 1997; Korpi and Tahlin, 2009). However, the main problem with the IV approach is the difficulty in finding appropriate instruments for each of the match terms. This is true for the data we utilised here. If instruments are assigned for education, they cannot serve as instruments for over and under-education, which consequently places doubt on the validity of an instrument (Leuven & Oosterbeek 2011).

14 The LM is a Breusch and Pagan Lagrangian multiplier test designed to examine random effects. The null hypothesis of the one-way random group effect model is that variances of groups are zero. If the null hypothesis is accepted, the implication is that the pooled regression (OLS) model is more appropriate than the RE (Wooden & Bora 1999). Nevertheless, the OLS estimation of wage impacts of over-education and mismatch are available upon request.

15 Since the earnings regression specification is in semi-logarithmic form, the percentage point effect (PE) is obtained using the following formula:

$$PE = (e^{\beta} - 1) \times 100, \text{ where } \beta \text{ is the coefficient estimate.}$$

The percentage point effect will be used throughout the discussion in this chapter.

16 For detail about this specification, see Zakariya (2014)

17 We have combined response 1 (your own field of study) into response 2 (related to your own field of study) due to a small number of observation reported for the former.

REFERENCES

Allen, B. J., & Velden, R. Van Der. 2001. Educational mismatches versus skill mismatches: effects on wages, job satisfaction , and on-the-job search. *Oxford Economic Papers* 3: 434–452.

Annie, M. & Hamali, J. 2006. Higher education and employment in Malaysia. *International Journal of Business and Society* 7: 102–121. http://www.myjurnal.my/filebank/published_article/14503/article6.pdf

Battu, H., Belfield, C. & Sloane, P. 2003. Human capital spillovers within the workplace: Evidence for Great Britain. *Oxford Bulletin of Economics* 65(5): 0575–0594. http://onlinelibrary.wiley.com/doi/10.1111/j.1468-0084.2003.00062.x/full

Battu, H. 2007. Overeducation amongst the young in the OECD: A Review. OECD Commissioned Report.

Becker, G. S. 1962. Investment in human capital: A theoretical analysis. *The Journal of Political Economy* 9–49.

Becker, G. S. 2009. *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education.* Chicago: University of Chicago Press.

Belfield, C., & Harris, R. 2002. How well do theories of job matching explain variations in job satisfaction across education levels? Evidence for UK graduates. *Applied Economics* (July 2011): 37–41.

Brynin, M. 2002. Overqualification in employment. *Work, Employment and Society* 16(4): 637-654.

Brynin, M., & Longhi, S. 2009. Overqualification: Major or minor mismatch? *Economics of Education Review* 28(1): 114–121. doi:10.1016/j.econedurev.2008.01.003.

Chevalier, A. & Lindley, J. 2009. Overeducation and the skills of UK graduates. *Journal of the Royal Statistical Society: Series A (Statistics in Society)* 172(2): 307–337. doi:10.1111/j.1467-985X.2008.00578.x.

Dolton, P., & Vignoles, A. 2000. The incidence and effects of overeducation in the U.K. graduate labour market. *Economics of Education Review* 19(2): 179–198. doi:10.1016/S0272-7757(97)00036-8.

Fleming, C. M. & Kler, P. 2008. I'm too clever for this job: a bivariate probit analysis on overeducation and job satisfaction in Australia. *Applied Economics* 40(9): 1123–1138. doi:10.1080/00036840600771254.

Frank, R. H. 1978. Why women earn less: the theory and estimation of differential overqualification. *American Economic Review* 68(3): 360–373.

Frenette, M. 2004. The overqualified Canadian graduate: The role of the academic program in the incidence, persistence, and economic returns to overqualification. *Economics of Education Review* 23(1): 29–45.

Green, F., & McIntosh, S. 2007. Is there a genuine under-utilization of skills amongst the over-qualified?. *Applied Economics* 39(4), 427–439.

Groot, W. 2000. Overeducation in the labor market: a meta-analysis. *Economics of Education Review* 19: 149–158.

Groot, W., & Maasen Van Den Brink, H. 1997. Allocation and the Returns to Over-education in the UK. *Education Economics* 5(2): 169–183. doi:10.1080/09645299700000014.

Gujerati, D. N. 2004. *Basic Econometrics*. 4th edition. New York: The McGraw-Hill.

Hartog, J. 2000. Over-education and earnings: where are we, where should we go? *Economics of Education Review* 19(2): 131–147.

Kler, P. 2006. The impact of overeducation on job satisfaction among tertiary educated Australians. Labour Economics Research Group, The University of Melbourne.

Korpi, T., and Tåhlin, M. (2009). Educational mismatch, wages, and wage growth: Overeducation in Sweden, 1974-2000. *Labour Economics* 16(2): 183–193.

Leuven, E., & Oosterbeek, H. 2011. Overeducation and Mismatch in the Labor Market Overeducation and Mismatch in the Labor Market, (5523).

Lim, H. 2011. The determinants of individual unemployment duration: the case of Malaysian graduates. *Journal of Global Management* 2(1): 184–203.

Lim, H.-E., Rich, J., & Harris, M. N. 2008. Employment Outcomes of Graduates: The Case of Universiti Utara, Malaysia*. *Asian Economic Journal* 22(3): 321–341. doi:10.1111/j.1467-8381.2008.00280.x.

McGuinness, S. 2006. Overeducation in the labour market. *Journal of Economic Surveys* 20(3): 387–418.

McGuinness, S., & Bennett, J. 2007. Overeducation in the graduate labour market: A quantile regression approach. *Economics of Education Review* 26(5): 521–531. doi:10.1016/j.econedurev.2005.12.003.

Ministry of Education. 2012. *National Education Statistic: Higher Education Sector.* Putrajaya: Kuala Lumpur.

Morshidi, S., Buang, A. A., Mohd Isa, A. M., Padian, A., Abdullah, M.A., Ibrahim, M.D., Piei, M.H., Lee, M.N.N., Shuib, M., Bakar, R., Mustafa, R., Abdul Rahman, S., A Hamid, S.Z., Ching Mey, S.S., and Mahmood, W.A.K. 2004. *The Problem of Unemployed Among Graduate (Masalah Pengangguran di Kalangan Siswazah).* Unpublished. Penang: National Higher Education Institute (IPPTN).

Osman, Z., Yussof, I., & Abu Hassan, M. S. 2009. Inflasi pendidikan mengikut ketentuan dalam pasaran buruh malaysia (education inflation in accordance to malaysian labour market indication). In *Prosiding PERKEM IV, JILID* 22: 439–454). UKM.

Robst, J. 1994. Measurement error and the returns to excess schooling. *Applied Economics Letters* 1(9): 142–144. doi:10.1080/135048594357989.

Robst, J. 2007. Education and job match: The relatedness of college major and work. *Economics of Education Review* 26(4): 397–407.

Robst, J. 2008. Overeducation and college major: Expanding the definition of mismatch between schooling and jobs. *The Manchester School* 76(4): 349–368.

Rubb, S. 2003. Overeducation: a short or long run phenomenon for individuals? *Economics of Education Review* 22(4): 389–394. doi:10.1016/S0272-7757(02)00052-3

Rubb, S. 2005. Overeducation, undereducation, and the theory of career mobility: a comment and a note on underemployment. *Applied Economics Letters* 12(2): 115–118. doi:10.1080/1350485052000337770.

Sattinger, M. 1993. Assignment models of the distribution of earnings. *Journal of Economic Literature*, 831–880.

Sicherman, N. & Galor, O. 1990. A theory of career mobility. *Journal of Political Economy* 98(1):169–192.

Sloane, P. J., Battu, H. & Seaman, P. T. 1996. Overeducation and the formal education/experience and training trade-off. *Applied Economics Letters* 3: 511–515.

Spence, M. 1973. Job market signaling. *The Quarterly Journal of Economics* 87: 355–374.

Thurow, L. C. 1975. *Generating Inequality: Mechanisms of Distribution in the US Economy.* Basic Books.

Wooden, M. & Bora, B. 1999. Workplace characteristics and their effects on wages: Australian evidence. *Australian Economic Papers* 38(3): 276–289.

World Bank. 2011. *MALAYSIA ECONOMIC MONITOR: Brain Drain*. Bangkok.

World Bank. 2009. *World Bank. (2009). Malaysia productivity and investment climate assessment update. No. 49137-MY.* Washington, DC.

Zakariya, Z. 2012. *Overeducation and Overskilling in Malaysia.* Aberdeen: University of Aberdeen. Retrieved from http://books.google.com.my/books?id=ykSEoAEACAAJ

Zakariya, Z. 2013. Returns to Education: What roles do over, required and under-education play? In *Prosiding PERKEM IV, JILID 1* 1: 266–278). Johor Baharu: Universiti Kebangsaan Malaysia.

Zakariya, Z. 2014. The effects of over, required and under-education on earnings in manufacturing sector in Malaysia. *International Journal of Management Studies* 21(1): 83–109.

Zakariya, Z., & Battu, H. 2013. the effects of overeducation on multiple job satisfaction towards enhancing individual s 'well-being in Malaysia. *Business and Management Quarterly Review* 4: 38–51.

Zakariya, Z., & Mohd. Noor, M. A. 2014. Workplace characteristics and determinants of over-education and overskilling in the manufacturing sector in Malaysia. *Jurnal Pengurusan* 40: 125–136. http://ejournals.ukm.my/pengurusan/article/view/7124

Zainizam Zakariya
Faculty of Management and Economics
Universiti Pendidikan Sultan Idris
35900 Tanjung Malim
Perak, Malaysia
Email : zainizam@fpe.upsi.edu.my